

10-1-2014

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Recommended Citation

Matthew Richard Wallaert , '05; Andrew Ward; and T. Mann. (2014). "Reducing Smoking Among Distracted Individuals: A Preliminary Investigation". *Nicotine And Tobacco Research*. Volume 16, Issue 10. 1399-1403.
<http://works.swarthmore.edu/fac-psychology/197>

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BRIEF REPORT

Reducing Smoking Among Distracted Individuals: A Preliminary Investigation

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Received January 20, 2014; accepted June 18, 2014

ABSTRACT

Introduction: According to the attentional myopia model, salient cues that serve to inhibit behavior can be especially effective under conditions of limited attention. A small field study tested the implications of this model for smoking reduction.

Methods: Twenty-three undergraduate smokers were exposed to a prominent health warning for 2 5-day experimental phases, with phase order counterbalanced across participants. During one phase, participants simply viewed the warning at regular intervals. During the other phase, participants viewed the warning for the same duration but also simultaneously performed a distracting cognitive load task.

Results: Participants in the phase that combined a health warning with cognitive load reported smoking significantly fewer cigarettes and taking significantly fewer puffs of smoke as compared to a baseline comparison phase—a reduction in smoking not observed in the absence of cognitive load.

Conclusions: Sources of attentional distraction may heighten the impact of salient smoking warnings, resulting in significant reductions in smoking.

INTRODUCTION

The U.S. Food and Drug Administration (FDA) has recently attempted to require more prominent health warnings on cigarette packages and advertisements (see [Deyton, Sharfstein, & Hamburg, 2010](#))—a move that has faced legal opposition from tobacco companies ([Dennis, 2013](#)). While smokers who notice warnings are more likely to endorse health risks of smoking ([Hammond, Fong, McNeill, Borland, & Cummings, 2006](#)), behavioral effects on individuals not attending carefully to warnings remain unclear. What, for example, is the impact of inserting into a magazine advertisement a smoking warning that is noticed but not scrutinized?

In this preliminary investigation, drawing on the attentional myopia model ([Mann & Ward, 2004, 2007](#)), we investigate the impact of smoking warning labels on distracted smokers. According to the model, when attention is limited, individuals can focus on only the most salient cues, to the neglect of more distal stimuli. This state of attentional narrowing is predicted to lead to disinhibited behavior when cues serve to promote the behavior in question, with enhanced behavioral inhibition resulting when cues instead suggest restraint (see [Steele & Josephs, 1990](#)).

In a laboratory investigation of the model ([Westling, Mann, & Ward, 2006](#)), smokers were exposed for 12 min to cues promoting or discouraging tobacco use while they performed a cognitive load task. As predicted, participants' smoking under high cognitive load revealed greater respective influence of

promoting or inhibiting cues than did that of smokers under low cognitive load. Indeed, in the presence of inhibiting cues, the introduction of high cognitive load reduced smoking (assessed by inhaled carbon monoxide) by nearly 50%.

In the present investigation, we endeavored to replicate these results in a more naturalistic environment. During a multiday field study, habitual smokers were exposed to a salient inhibiting cue in the form of a prominent health warning label while either experiencing attentional distraction produced by cognitive load or remaining relatively undistracted. We predicted that cognitive load would enhance the impact of a salient warning designed to discourage smoking.

METHODS

Participants

Undergraduates who smoked at least five cigarettes per day were recruited to take part in a 15-day study in exchange for monetary compensation of either \$50 (during an early version of the study) or \$75 (during a later identical version; analyses revealed no interaction with level of monetary compensation). They initially completed a survey probing demographic information, along with their daily smoking habits and any attempts at quitting. Twenty-three participants (six females)

doi:10.1093/ntr/ntu117

Advance Access publication August 6, 2014

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completed the study. One additional participant failed to meet our inclusion criterion, smoking, on average, only 3.2 cigarettes per day during the baseline phase. This participant was dropped from the final analysis. However, the addition of this participant's data did not alter the significance of the reported load-plus-label effect on either dependent measure (see below).

An additional four participants (three females) failed to complete the study's experimental protocol, and their data were omitted from analyses. This percentage (17%) falls in the lower third of the range of dropout rates for smoking cessation interventions (Kottke, Battista, DeFries, & Brekke, 1988). And although our study was not presented as a cessation intervention, from participants' standpoint, it employed similar elements (e.g., a manipulation featuring a strong prohibition against smoking). The four omitted participants smoked somewhat more cigarettes ($M = 13.90$) during baseline than did the included group ($M = 10.38$), and a greater proportion of them (100% vs. 65%) had ever tried to quit smoking. All omitted participants reported they were currently trying to reduce the number of cigarettes they smoked per day, versus only three of the 23 (13%) included participants. The included sample ranged in age from 18 to 23 years old ($M = 20.30$, $SD = 1.22$). The age at which they first smoked ranged from 12 to 20 years old ($M = 16.61$, $SD = 2.02$), and they had smoked for between 1 and 7 years ($M = 3.70$, $SD = 1.69$). They also reported typically smoking anywhere from 5 to 20 cigarettes per day ($M = 10.78$, $SD = 4.14$). The self-reported racial/ethnic composition of the sample was 57% White, 17% Asian, 9% Hispanic, and 17% "mixed race or other."

Procedure

The procedure included an initial 5-day baseline period followed by two 5-day experimental phases (each lasting Monday through Friday). Participants were asked to keep daily tallies of the number of cigarettes smoked and "puffs" of smoke taken—the latter count accomplished through a handheld digital counter

provided to each participant. Participants were also asked to indicate at the end of each day, using 7-point scales (1 = not at all; 7 = very), how positive, negative, and stressed they felt that day, along with the strength of their urge to smoke. Each night they transmitted all their data via E-mail to a secure Web site. Participant received periodic E-mail and/or telephone reminders from one of the authors or a research assistant to ensure precise compliance with the protocol. Participants also met with the research team at the beginning and end of each phase and were quizzed on their compliance; among the 23 completed protocols, all reported compliance with the protocol, and there were no missing data points.

The first period provided for assessment of baseline levels of smoking. In a subsequent experimental phase, the "label" condition was introduced, in which participants were provided with a cigarette lighter and asked to use it every time they smoked, as well as to look at the lighter for 30 s each waking hour. Affixed to, and occupying essentially the entire side of each lighter was a prominent warning label with the message, "SMOKING KILLS" (see Figure 1). An alternate phase saw the introduction of the "label-plus-load" condition, which was identical to the label condition, with the exception that participants were also asked to count backward from 100 by 5s every time they viewed the lighter (repeating the count-down sequence if necessary until 30 s had elapsed). Order of the two experimental phases was counterbalanced across participants.

RESULTS

Individual participant averages across the 5 days of each phase were computed for each of the dependent variables. Analyses of variance revealed that the effects reported below for number of cigarettes smoked and puffs taken did not interact significantly with participant sex or experimental phase order; and an analysis of covariance revealed a similar lack of interaction with number of years participants had smoked.



Figure 1. Sample cigarette lighter with label affixed.

Cigarettes Smoked

A repeated measures analysis of variance on the number of cigarettes smoked revealed a significant effect of condition, $F(2, 44) = 4.67$, $p = .014$, $\eta_p^2 = 0.18$ (see Figure 2a). Participants reported smoking significantly fewer cigarettes in the label-plus-load condition ($M = 8.83$, $SD = 4.16$), 95% confidence interval (CI) = 7.03, 10.63, than during the baseline condition ($M = 10.38$, $SD = 4.51$), 95% CI = 8.43, 12.33, $F(1, 22) = 7.24$, $p = .013$, $\eta_p^2 = 0.25$. They also smoked significantly fewer cigarettes than when they were presented with the warning label alone ($M = 10.17$, $SD = 4.20$), 95% CI = 8.35, 11.98, $F(1, 22) = 5.79$, $p = .025$, $\eta_p^2 = 0.21$, with the latter mean not differing significantly from the baseline condition, $F = 0.18$, ns.

Puffs Taken

Analysis of puffs revealed a similar significant pattern, $F(2, 44) = 3.24$, $p = .049$, $\eta_p^2 = 0.13$ (see Figure 2b). Participants

exposed to a warning label while under cognitive load took significantly fewer puffs ($M = 130.20$, $SD = 74.07$), 95% CI = 98.17, 162.23, than during the baseline phase of the study ($M = 150.97$, $SD = 75.66$) 95% CI = 118.25, 183.68, $F(1, 22) = 6.48$, $p = .018$, $\eta_p^2 = 0.23$. The mean number of puffs taken in the warning label condition ($M = 150.89$, $SD = 85.12$), 95% CI = 114.08, 187.69, again fell between the baseline and label-plus-load conditions, but although the difference between it and the label-plus-load condition mean was nearly significant, $F(1, 22) = 3.93$, $p = .06$, $\eta_p^2 = 0.15$, again there was not a statistical difference between it and the baseline condition mean, $F = 0$.

Additional Measures

No significant effects emerged for the analysis of how stressed ($M = 4.09$, $SD = 0.77$), positive ($M = 4.32$, $SD = 0.70$), or negative ($M = 3.32$, $SD = 0.73$) participants reported feeling across the study's three phases. Nor was there a significant difference

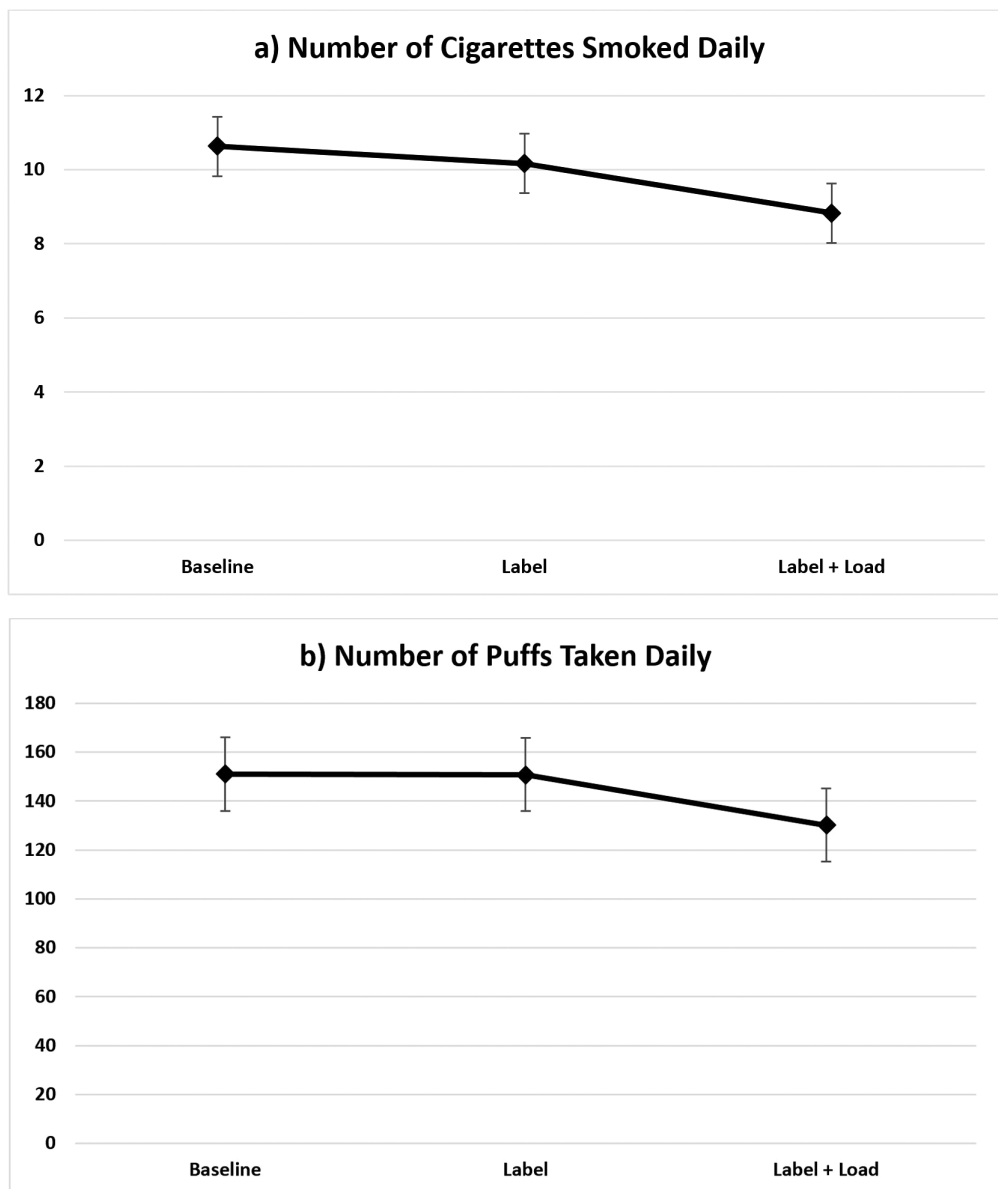


Figure 2. Mean number of cigarettes smoked (a), and puffs taken (b). Error bars represent SEs.

among the conditions regarding participants' urge to smoke ($M = 4.36$, $SD = 0.53$).

DISCUSSION

Smokers exposed to a health warning while engaging in a brief, simple cognitive load task reported both smoking fewer cigarettes and taking fewer puffs of smoke than they had during a comparable baseline period. By contrast, the use of a warning label alone resulted in smoking levels that did not differ from baseline. In other research, graphic warning labels have been shown to increase recall for the relevant warning (Strasser, Tang, Romer, Jepson, & Cappella, 2012), enhance knowledge of smoking risks (Borland & Hill, 1997), reduce the likelihood of former smokers lighting up again (Hammond, McDonald, Fong, Brown, & Cameron, 2004), discourage current smokers from wanting to smoke (Cameron, Pepper, & Brewer, 2013), and reduce cigarette use among active smokers (Willemssen, 2005). But efforts to implement such warnings in the United States are currently stalled, and the evidence to date suggests that less prominent text-only warnings found on U.S. cigarette packs are much less likely to produce any of the those effects (Hammond, 2011).

While the present results support the limited effectiveness of text-based warnings alone, our findings suggest that viewing text-based labels while engaging in a simple cognitive task can substantially enhance their effectiveness in reducing smoking (see Parent, Ward, & Mann, 2007, for comparable results in another health-relevant domain). The findings would appear to be especially timely, given the recent failure of the FDA to mandate the placement of more prominent warning labels on cigarette packages.

In considering our results, it could be argued that the cognitive load task served to distract smokers away from the desire to smoke, but our past findings do not support such an argument (Westling et al., 2006). In this and in other domains, cognitive load in the absence of a salient inhibiting pressure has been found to increase, not decrease, the behavior in question (e.g., Ward & Mann, 2000). Moreover, in the present study, relevant assessments suggested that the cognitive load manipulation did not reduce smoking desires or alter mood.

This study relied on self-report regarding compliance with the protocol and smoking behavior; however, self-reports, at least with regard to smoking levels, have been found to be extremely accurate (Arheart et al., 2008; Klebanoff et al., 2001; Patrick et al., 1994). An obvious limitation of this preliminary study involves the sample size (along with the relative paucity of female participants), but given the relatively small n , the statistically significant results we reported speak, in some ways, to the substantial impact of this simple manipulation (see Rosenthal, 1995). Indeed, the effect size we reported was of a similar magnitude to that shown in our comparable laboratory investigation (Westling et al., 2006). Moreover, this study met the recommendations for minimal sample size (i.e., at least 20 per cell) that have recently been advanced in a widely cited methodological critique (Simmons, Nelson, & Simonsohn, 2011).

The cognitive load task employed in this study (i.e., counting backward from 100 by 5s) was relatively simple and

straightforward. Future research will help determine whether other attentional manipulations, when coupled with warnings, can be as effective in curbing smoking in the field. One laboratory study (Westling et al., 2006) found that another cognitive load task (i.e., holding a series of numbers and letters in memory) in the presence of inhibiting cues (e.g., a poster advertising a campaign to encourage smokers to quit) also resulted in smoking reductions, but its application to real-world smoking behavior remains untested.

Conclusions

The vast majority of our participants were not currently trying to limit their smoking. That this group showed measurable reductions in their smoking under cognitive load suggests that targeting habitual smokers with health warnings can be effective when done so under the right conditions.

FUNDING

This work was supported by the National Heart, Lung, and Blood Institute (HL88887).

DECLARATION OF INTERESTS

None declared.

ACKNOWLEDGMENTS

We thank S. Buchl, M. Marzouk, and S. Tomlinson for assistance with this research.

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